Better Buildings®
U.S. DEPARTMENT OF ENERGY

Better Buildings Residential Network
Peer Exchange Call Series

Wildfires – How Can Residential Energy Efficiency Create a Healthier Indoor Environment?

August 10, 2023

U.S. DEPARTMENT OF ENERGY

Agenda and Ground Rules

- Moderator
  - **Jonathan Cohen,** Better Buildings Residential Network, DOE Residential Buildings Integration Program (RBI)
- Agenda Review and Ground Rules
- Residential Network Overview and Upcoming Call Schedule
- Opening Poll
- Featured Speakers
  - **Eric Sun,** International WELL Building Institute
  - **Alysson Blackwelder,** UL Solutions
  - **Lisa Patel,** Medical Society Consortium on Climate and Health
- Open Discussion
- Closing Poll and Announcements

Ground Rules:

1. **Sales of services and commercial messages are not appropriate** during Peer Exchange Calls.
2. Calls are a safe place for discussion; **please do not attribute information to individuals** on the call.

The views expressed by speakers are their own, and do not reflect those of the Dept. of Energy.

Join the Network

Member Benefits:

- Recognition in media, social media and publications
- Speaking opportunities
- Updates on latest trends
- Voluntary member initiatives
- One-on-One brainstorming conversations

Commitment:

- Members only need to provide *one number*: their organization's number of residential energy upgrades per year, or equivalent.

Upcoming Calls (2nd & 4th Thursdays):

- *9/14: Heat Pumps – With Unprecedented Incentives, Where Are We Now?*
- *9/28: Combining Incentives from the Inflation Reduction Act, Tax Credits and Other Sources*

Peer Exchange Call summaries are posted on the Better Buildings website a few weeks after the call

Eric Sun

International WELL Building Institute (IWBI)

INTERNATIONAL WELL BUILDING INSTITUTE™

Wildfires - How Can Residential Energy Efficiency Create a Healthier Indoor Environment

WELL for residential pilot

Health starts at home

Name: Eric Sun
Title: Senior Manager, Standard Development, Air and Thermal Comfort concepts Lead
Credentials: WELL AP, RESET AP, Council-Certified Indoor Environmentalist (CIE)
Organization: IWBI
Location: Los Angeles, California

Eric Sun serves the Standard Development team as the Air and Thermal Comfort Concepts Lead. He harnesses his international experience in indoor environmental quality and understanding of continuous monitoring systems, added to his deep understanding of building rating systems, to help progress the health and wellness movement in the built environment and beyond. Prior to joining IWBI, Eric worked as a Global Project Manager for Société Générale de Surveillance (SGS), utilizing continuous air monitoring systems combined with traditional laboratory analysis to help teams understand and improve their air quality. He also worked as a WELL Assessor for Green Business Certification Inc. (GBCI), conducting documentation reviews and performance verification audits for projects pursuing WELL while also leading performance testing agent workshops. Additionally, Eric spent 5 years in Shanghai working as the Director of Consulting for PureLiving China and led over 450 indoor environmental quality projects abroad, including the world's first LEED + WELL double-platinum project (JLL Shanghai), China's first WELL v1 (Haworth Shanghai) project, and Asia's first LEED v4 Platinum (Glumac Shanghai) and ARC Skoru (Parkview Green Beijing) projects. He holds a B.S. in Human Biology from the University of California, San Diego (UCSD).


●●●○○ 中国联通
2:44 AM
83%
Air Quality Index
Monitoring site nearby
美领事馆 2.7KM
470
Hazardous
PM2.5 455
PM10 --
SO2 --
NO2 --
470
Shanghai
US Consulate
Hazardous
Protection recommended
晴转阴 9~15°C 西南风转西北风3-4级
2013-12-06 02:00
PM2.5 455
PM10 --
SO2 --
NO2 --
500
Shanghai
Beyond index
Protection recommended
晴转阴 9~15°C 西南风转西北风3-4级
2013-12-06 02:00
PM2.5 509
PM10 567
SO2 46
NO2 142
Dior
ONE ESSENTIAL
迪奥密集修护精华露
清肌修复焕活，护肤保养第1步
我的选择，我的红色1号


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Sunset Blvd 2 1/2
Wilshire Blvd 3 3/4
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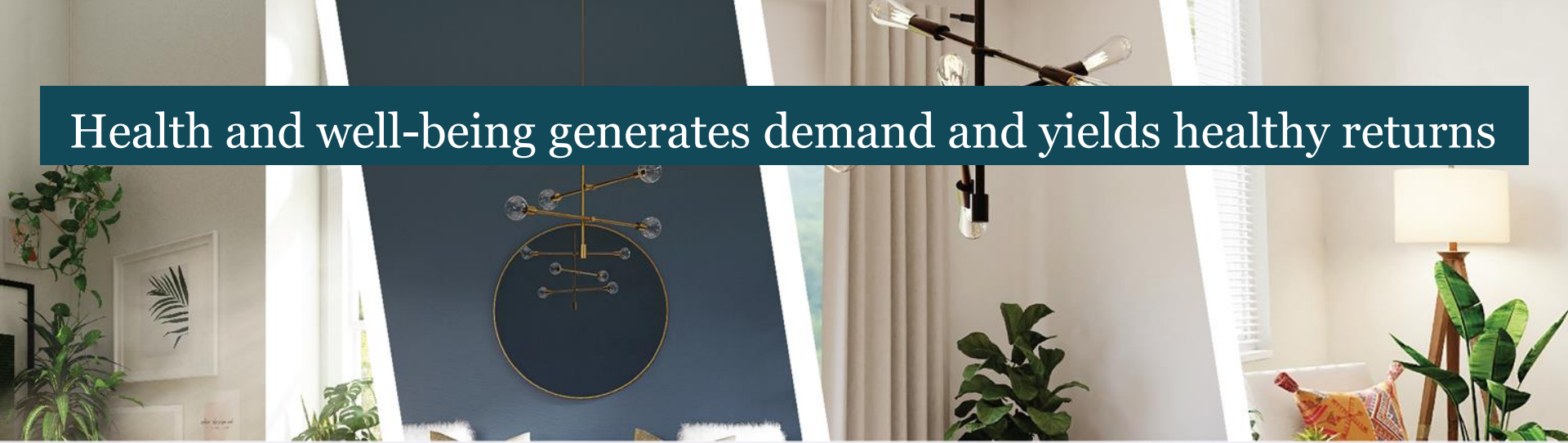
Health and well-being generates demand and yields healthy returns



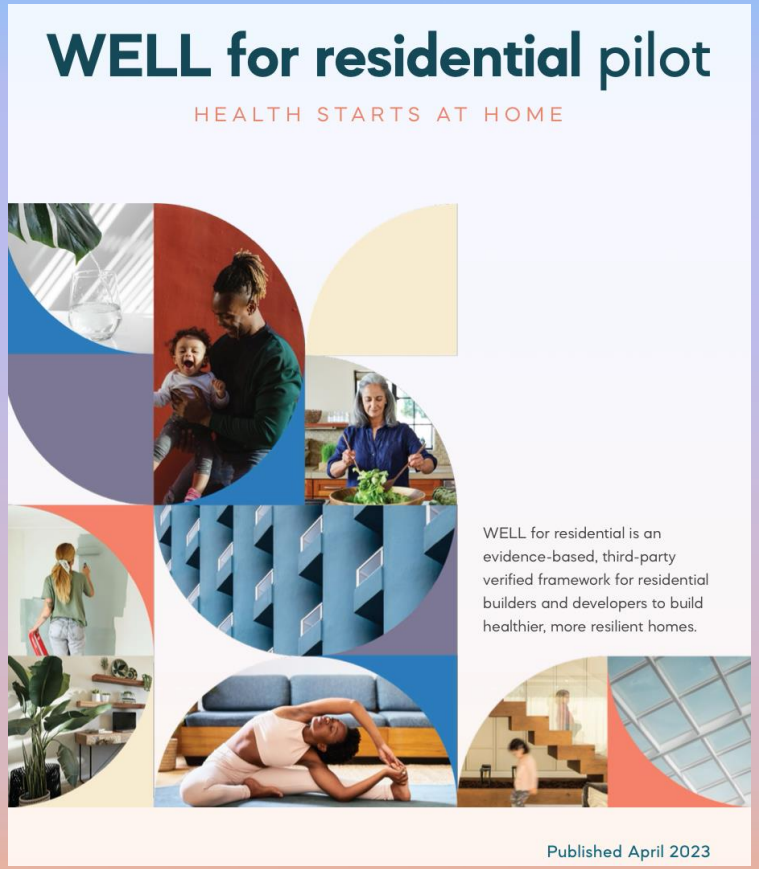
57% of homeowners value health and well-being more than energy savings.

69% of homeowners prioritize physical and mental health more than they did a year ago.[1]

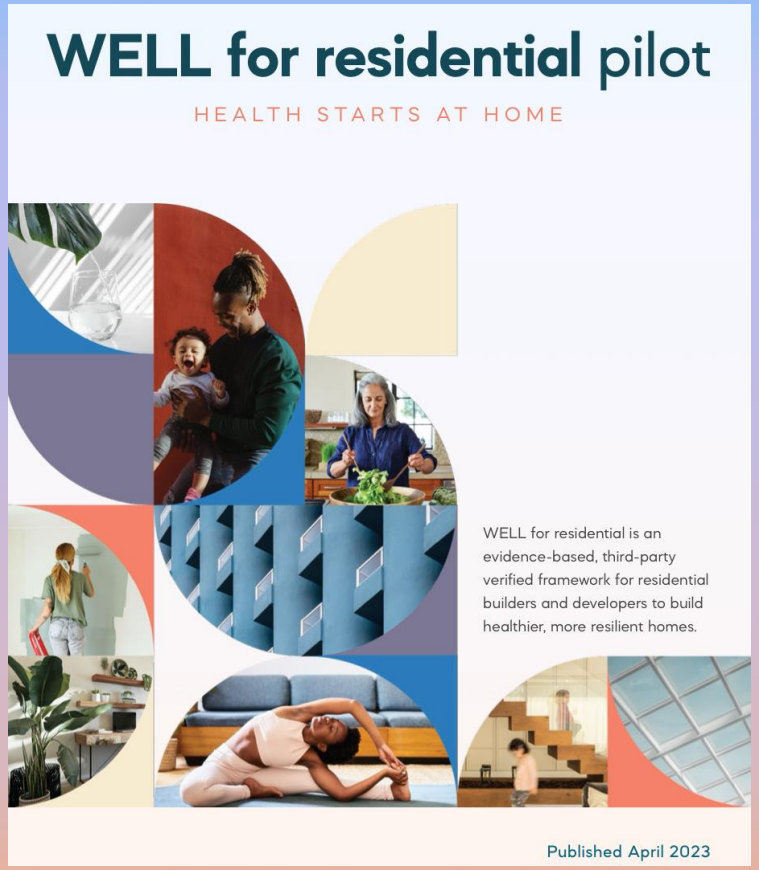
Nava Real Estate's WELL Certified residential property experienced a **spike in sales** after certification.[2]

New residences sell for **6-11.7% more** and renovated homes for **12.7% more** when verified through a third-party program.[3,4]

To date, there is no holistic healthy home program on the market.



The **WELL for residential program** is an evidence-based, third-party verified framework for builders, developers and operators to create healthier, more resilient homes.



Every feature implemented results in **points earned.**

Individual residences that meet a minimum number of points will earn the **WELL Residence seal.**

Benchmark progress and differentiate performance by communicating the number of points earned.

WELL for residential: by the numbers

Built for the residential market *by* the residential market

Global insights from

100+ WELL Residential Advisors

20 Builders and Developers

WELL Residential Advisory

- Launched in 2021
- 20 co-chairs and 106 advisors
  - Global builders and developers, architects and designers, public health and building scientists, government officials and academics, manufacturers and smart tech companies, real estate professionals
- 14 countries represented
  - Australia, Canada, China, Colombia, Egypt, France, India, Netherlands, Philippines, Singapore, South Korea, Taiwan, United Kingdom, United States

- 20 builders, developers & operators including:
  - Brookfield Properties
  - Development Victoria
  - KB Home
  - Minto Communities
  - Pulte Group
  - Shea Homes
  - Taylor Morrison
  - Toll Brothers

Qualities of a WELL Residence

Improves air and water quality

Utilizes better, safer materials

Promotes safety and privacy

Encourages healthy eating

Boosts activity and daily movement

Provides good lighting and optimizes sleep

Makes your home more accessible

Optimizes productivity and energy

Feature examples

A01: Ventilation Design

Install Mechanical Exhausts
Provide Outdoor Air
Validate Ventilation
Install Cooking Exhaust Systems
Provide Demand-Controlled Ventilation

L03: Electric Light Control

Provide Controllable Lighting
Provide Programmable Lighting

S02: Quiet Products

Install Quiet Appliances
Install Noise-Reducing Surface Finishes

W02: Water Testing

Meet Water Performance Parameters
Test Kitchen Water Quality Parameters

X02: New Materials Selection

Install Healthier Building Materials

C06: Disaster resilience

Design for Resilience
Provide Backup Power
Provide Emergency Response Support

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Strategies Inspired by Traditional Energy Efficiency Programs

Strategies Inspired by Traditional Energy Efficiency Programs

A01: Ventilation Design

Install Mechanical Exhausts (ASHRAE 62.2, Cal Title 24)
Provide Outdoor Air (ASHRAE 62.2, ICC, EPA IAP)
Validate Ventilation (Energy Star, HERS Rater)
Install Cooking Exhaust Systems (ICC, HVI)
Provide Demand-Controlled Ventilation (CEC)

A03: Pollution Infiltration Management

Minimize Door and Window Infiltration (Energy Star)
Design Healthy Entryways (LEED air infiltration)
Minimize Envelope Air Leakage (LEED air infiltration)

Strategies Inspired by Traditional Energy Efficiency Programs

A04: Construction Pollution Management

Mitigate Construction Pollution (LEED IAQ mgmt. plan)
Conduct Air Flush-out (LEED IAQ Assessment, Contaminant ctrl)

A09: Electric Vehicle Charging

Support EV Charging (Title 24, CALgreen)

A10: Smoke-Free Environment

Prohibit Smoking (LEED ETS control)

Strategies Inspired by Traditional Energy Efficiency Programs

T01: Thermal Performance

Support Fundamental Thermal Comfort (Australia Gov Passive, ASHRAE 55)
Design Mechanical Heating and Cooling (CIBSE, ACCA, China GB)
Provide Cooling Fans

T04: Humidity Control

Manage Relative Humidity in Living Spaces
Dehumidify Subgrade Spaces (EPA IAP)
Meet Relative Humidity Thresholds (EPA)

Health-first Strategies that Impact Energy Efficiency

Health-first Strategies that Impact Energy Efficiency

A02: HVAC Filtration and Treatment

Improve Indoor Air Quality – media/carbon/UV filtration (EPA, US CDC, ASHRAE)
Implement Filtration for Outdoor Air Systems (ASHRAE)
Implement Surface UV Treatment (ASHRAE 185.2)

A05: Combustion Minimization

Minimize Combustion Sources (Cal fire code, EPA IAP)

Health-first Strategies that Impact Energy Efficiency

A06: Air Quality Monitoring

Monitor Indoor Air Quality
Install Smoke, CO, Gas Detectors (NFPA)
Monitor Outdoor Air Quality

A07: Indoor Air Quality Thresholds

PM, TVOC, CO, O3, NO2 (WHO, EPA NAAQS, CA EPA, Cal OEHHA)

A08: Radon Risk Mitigation

Reduce Risk of Radon Exposure (EPA)
Meet Radon Thresholds (WHO)

Health-first Strategies that Impact Energy Efficiency

T06: Operable Windows

Install Operable Windows (Cal 22 CCR, ASTM F2090/2006)
Provide Windows with Multiple Opening Modes

T07: Outdoor Heat Management

Manage Heat in Outdoor Spaces (LEED Heat Island Reduction)
Install Heat-Resistant Roof Tops

eric.sun@wellcertified.com

wearewell.com

Alysson Blackwelder

UL Solutions

IAQ Certifications for Multifamily and Commercial Buildings

How Can Residential Energy Efficiency Create a Healthy Indoor Environment?

Alysson Blackwelder
Environment & Advisory Services

August 10, 2023

Safety. Science. Transformation.™

Agenda

Introduction

Alysson Blackwelder

- Sales Executive, Environment & Advisory Services
- LEED Green Associate
- Background in sustainability, policy, and advocacy

Safety. Science. Transformation.™

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Why is Indoor Air Quality so Important?

According to the EPA, Americans spend about 90% of their time indoors, where the concentrations of some pollutants are often 2 to 5 times higher than typical outdoor concentrations.

- Homes, offices, schools, and other building environments

Reasons include:

- Combustion sources including cooking appliances and fireplaces
- Volatile organic compounds including cleaning supplies and paints
- Building materials including asbestos
- Outdoor sources like radon and carbon monoxide

90%

Why is Indoor Air Quality so Important?

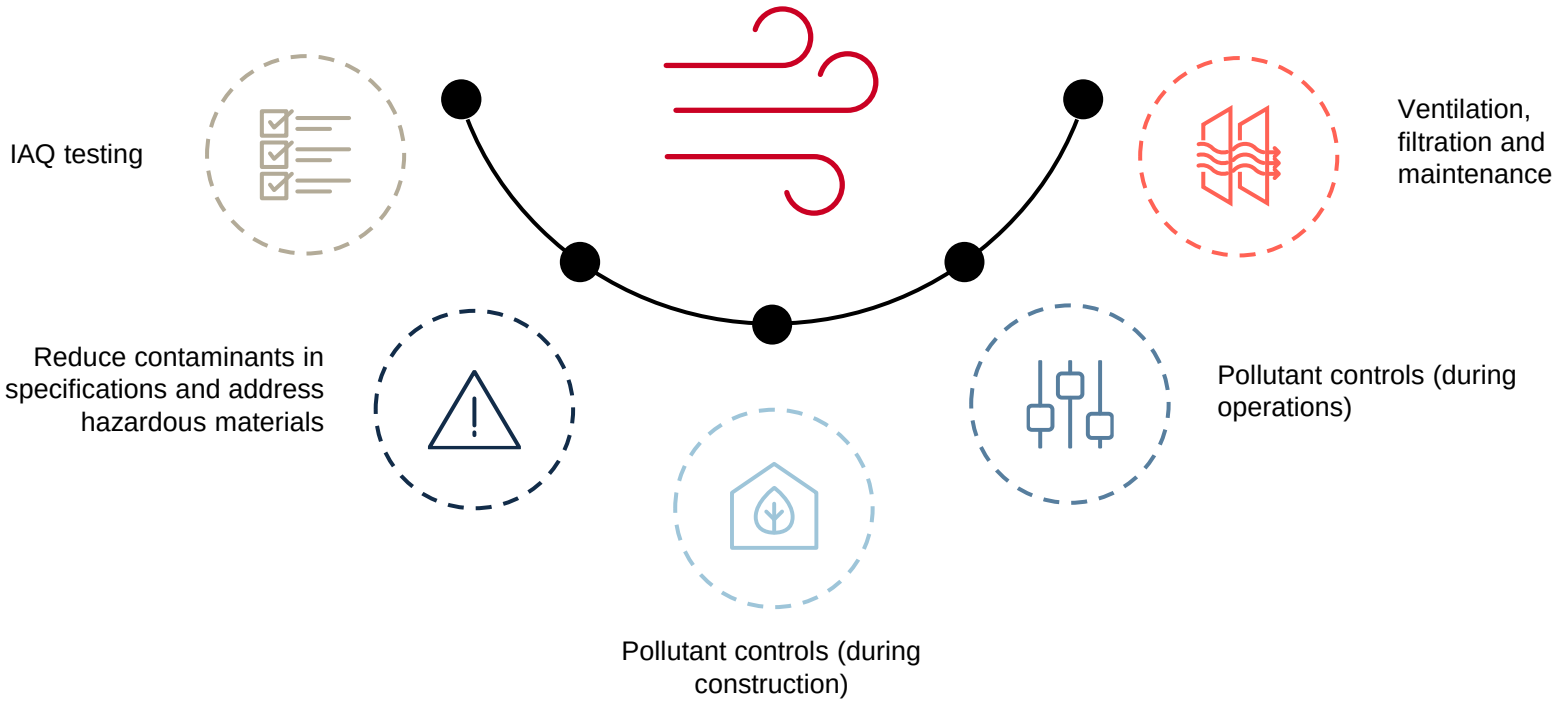
Poor indoor air quality has the potential to contribute to various negative health issues including:

- Respiratory diseases
- Dizziness, headaches
- Cancer and death

“Sick building syndrome” or SBS

- Condition where building occupants develop symptoms of illness or become infected with chronic disease as a result of time spent in a particular building

Indoor air quality



Proactive IAQ Testing

- Re-occupancy assessments
- RTO policies

UL Solutions

Re-occupancy Assessments

UL Solutions offers on-site building inspections following limited building use and to help support occupants returning to work.

UL Solutions evaluates building operations for heating, ventilation and air conditioning (HVAC) hygiene, filtration, ventilation, IAQ, water quality and janitorial efficacy.

Portions of the inspection scope include representative assessment of IEQ-related issues often found in buildings under limited operation for extended periods of time, e.g., water leaks, stagnant domestic water, etc.

UL Solutions offers a full suite of solutions to support your healthy building goals.

- Verified Healthy Building Program
- ASHRAE 188 Legionella compliance
- ASHRAE 62.1 ventilation assessments

Reactive Inspections

Healthy Buildings offers reactive services to building owners and managers to quickly identify and resolve indoor environmental disruptions.

- Mold and moisture inspections
- Mold clearance inspections
- Post-flood inspections
- Post-remediation inspections
- Focused air quality inspections
- Odor inspections
- Drinking water testing

Indoor Occupant Health Certifications

- IAQ is a priority
- Holistic approach to occupant health
- Often pursued by building owners, operators, and tenants seeking to reassure current and/or potential occupants of healthy indoor conditions

WELL Certification Case Study

Hensel Phelps offices in Northern California

- Health and wellbeing of employees was a priority
- Incorporated daylight-like lighting, movable partitions, and zero-VOC finishes
- WELL Platinum certification

Case Study

The Music Center earns UL Verified Healthy Building Mark

The Music Center is the first performing arts facility to earn UL Solutions Verified Healthy Building Mark for Indoor Air.

A landmark performing arts facility in Los Angeles, The Music Center includes a 22-acre complex encompassing four theaters and 36,000 square feet of outdoor space.

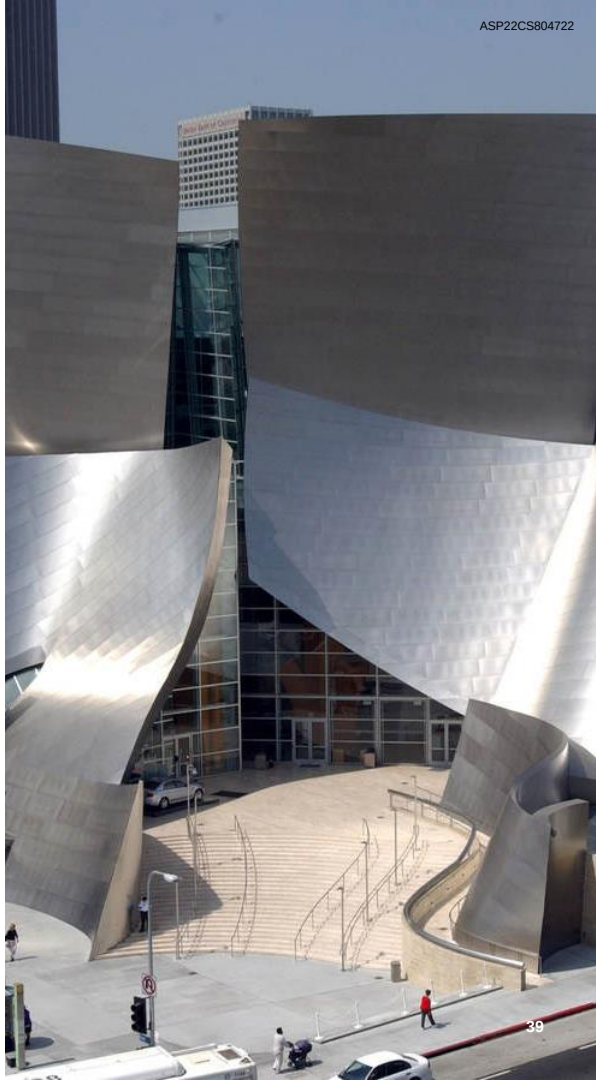
The Music Center has prioritized indoor environmental quality for more than 20 years, calling on UL Solutions to conduct a wide range of inspections including indoor air quality (IAQ), and the provision of preventative maintenance best practices.

While The Music Center prepares for reopening after an extended period of disruption due to COVID-19, the organization's management and its operations team feel confident that their efforts to provide healthier IAQ will help artists, patrons and employees feel safer as they return to support and experience the arts.

"Just as we select the best performers for our stages, we sought the top experts in the field of indoor air quality to provide us with expertise and services to support healthier indoor environments."

Keith McTague
Director and chief engineer,
Building Services at The Music Center

The Music Center Case Study



Sustainability Certifications

- IAQ is a priority along with energy efficiency, sustainability, etc.
- Often embraced by building owners, operators, and tenants seeking to meet a corporate commitment or demonstrate a sustainability goal

Sustainable SITES Initiative™

LIVING BUILDING CHALLENGE℠

UL Verified Healthy Building/LEED Case Study

Rising Realty Partners building in downtown Los Angeles: **1 Cal**

- Confidence in IAQ for occupants
- Cleanliness, lighting, and acoustics
- UL Verified Healthy Building Mark, LEED O+M Platinum, Net Zero Energy

Thank you

Alysson Blackwelder

alysson.blackwelder@ul.com

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Lisa Patel

Medical Society Consortium on Climate and Health

Wildfires, health, and equity

Dr. Lisa Patel
Clinical Associate Professor of Pediatrics, Stanford School of Medicine
Executive Director, Medical Society Consortium on Climate and Health

The Medical Society Consorti
ON CLIMATE & HEA

Theory of Change

The Medical Society Consortium ON CLIMATE & HEALTH

HARNESSING THE POWER OF NATURE, TECHNOLOGY, & COLLABORATION

OUR GOAL
Implementation of equitable climate solutions that protect and promote health.

Implement healthy, equitable climate policies

POLICY MAKERS
Local, State, & Federal

Activated by the health relevance of climate change

PUBLIC
Voters concerned about climate change

Organize • Empower • Amplify • Mobilize

Members, States, Affiliates, & Advocates

Health Voices
Trusted voices of health professionals are effective at conveying the message that climate change is real, is harming our health now, and climate solutions will benefit health.

GEORGE MASON UNIVERSITY
CENTER *for*
CLIMATE CHANGE
COMMUNICATION

The Medical Society Consortium ON CLIMATE & HEALTH

Objectives

- To describe the health consequences of worsening wildfire smoke
- To analyze methods to improve indoor quality for improved health outcomes
- To discuss policy changes needed to best protect health from an equity lens

The Medical Society Consortium
ON CLIMATE & HEALTH

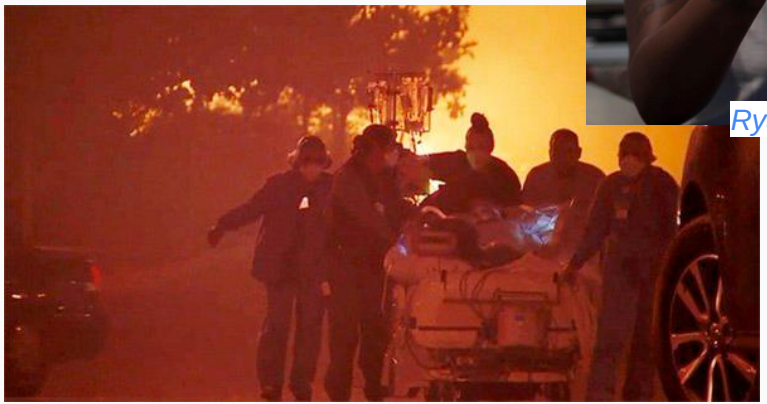
Steven Kazlowski / naturepl.com @wwf

The Medical Society Consortium
ON CLIMATE & HEALTH

Photographer: T. Narayan/Bloomberg

Ryan Delaney | St. Louis Public Radio

Luke Sharrett—Bloomberg/Getty Images



The Medical Society Consortium
ON CLIMATE & HEALTH

Wildfires, climate change, and health

The Medical Society Consortium
ON CLIMATE & HEALTH

Climate change is here

It is now

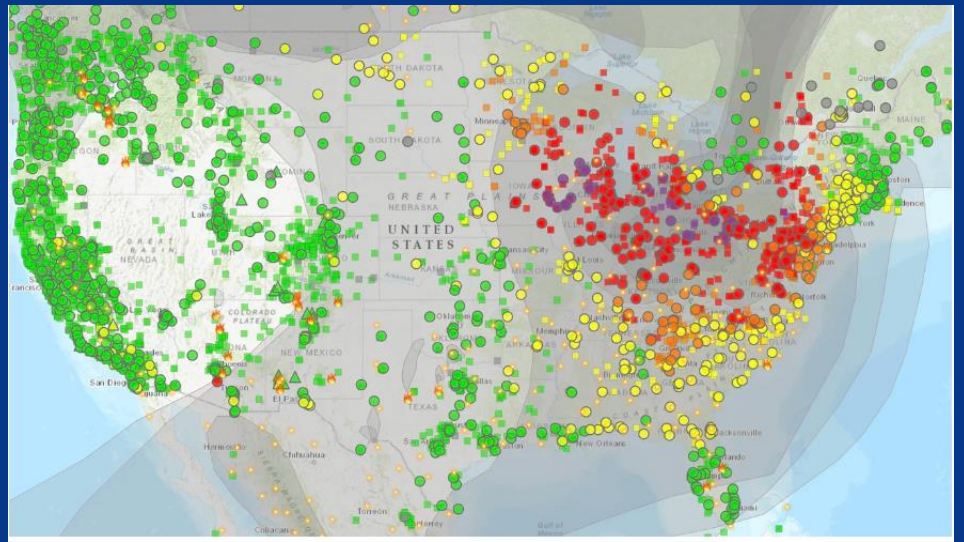
It is us

The Medical Society Consortium ON CLIMATE & HEALTH

Wildfires on the West Coast

The Medical Society Consortium
ON CLIMATE & HEALTH

Credit: David Dee Delgado/Getty Images



Poor air quality triggered orange, red and purple alerts over a large chunk of the U.S. on Thursday, as seen in this map published by the federal air quality site AirNow at 7 a.m. ET.

AirNow.gov

Wildfire smoke is spreading to new places that are unprepared

The Medical Society Consortium
ON CLIMATE & HEALTH

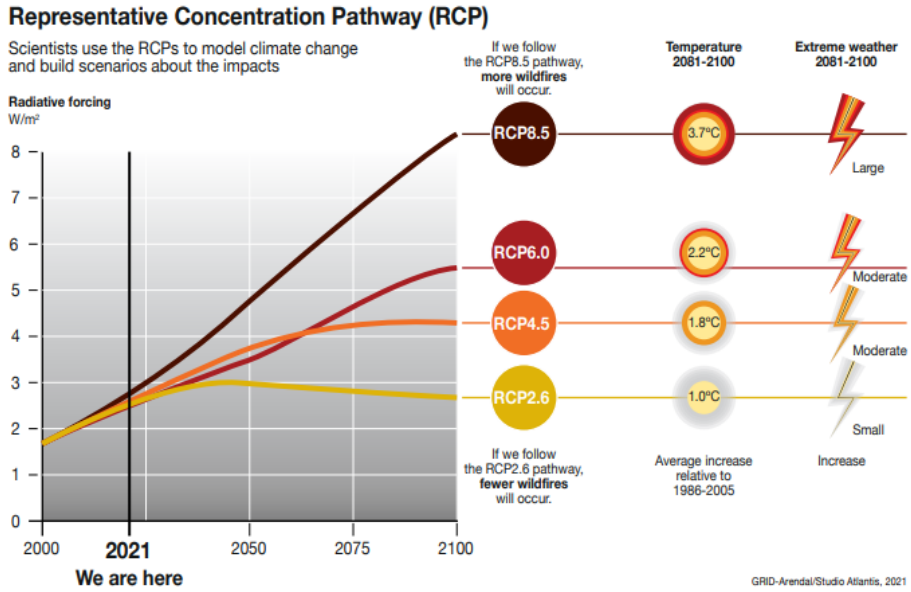


Figure 2.6. Representative Concentration Pathway(s) (RCPs) are trajectories of greenhouse gas concentrations used for climate modelling in the IPCC Fifth Assessment Report (IPCC 2013). The numerical values of the RCPs (i.e., 2.6, 4.5, 6.0 and 8.5) refer to the possible range of radiative forcing values in the year 2100. RCPs are used to build future climate scenarios based on greenhouse gas emissions from human activities, depending on the efforts taken to limit greenhouse gas emissions (high efforts taken under RCP2.6, low efforts under RCP8.5). RCP2.6 is the scenario that will likely keep global warming below 2°C by 2100 – this alone will have a significant impact on reducing wildfire occurrence (see also Figure 2.8).

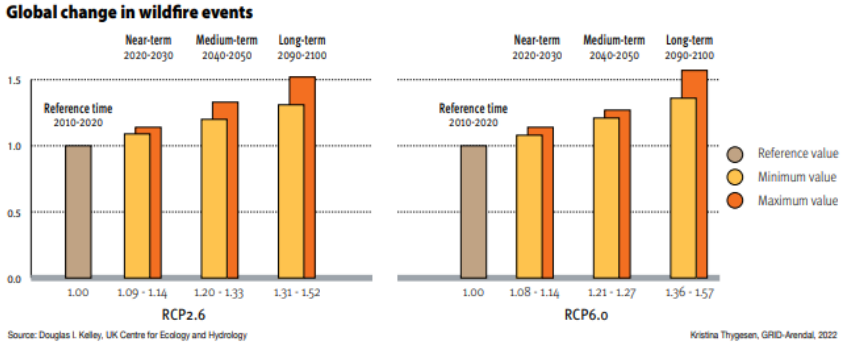


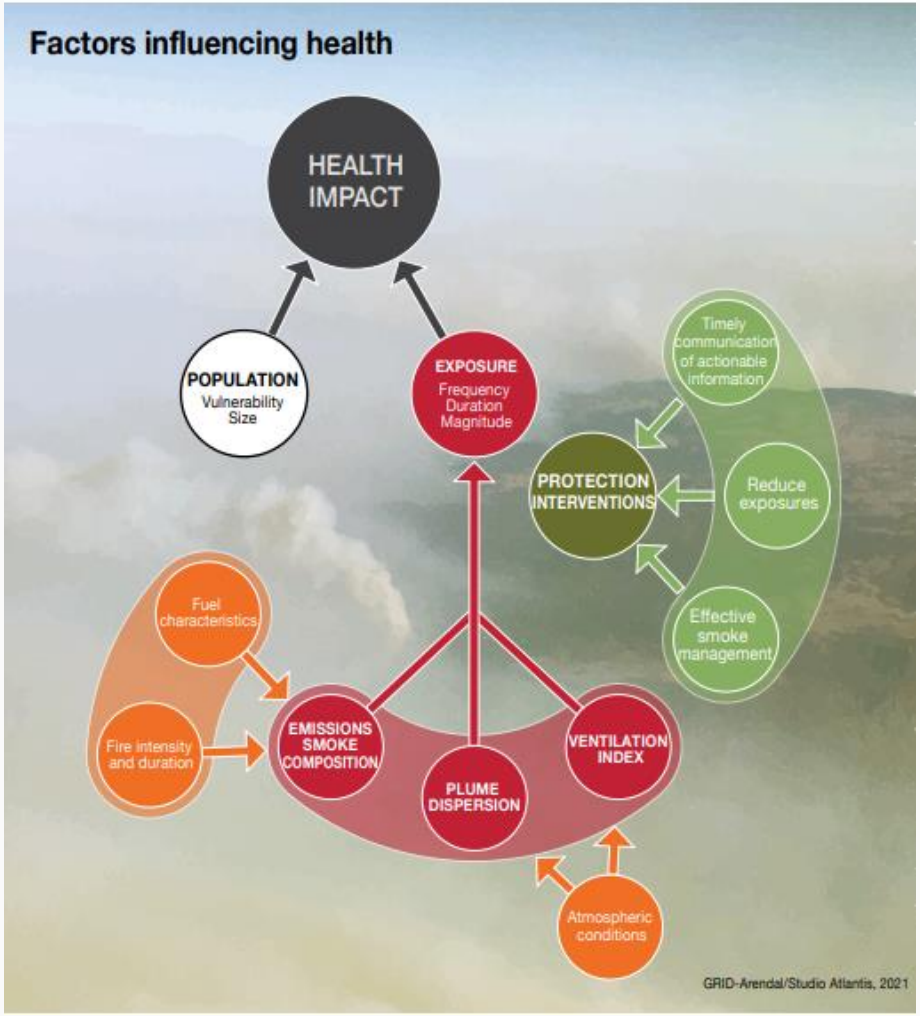
Figure 2.7. By the end of the century, the likelihood of catastrophic wildfire events will increase by a factor of 1.31 to 1.57. Even under the lowest emissions scenario, we will likely see a significant increase in wildfire events. See appendix for construction.

The likelihood of catastrophic wildfire events will increase without dramatic cuts in carbon pollution

Society Consortium ON CLIMATE & HEALTH

Wildfires and health

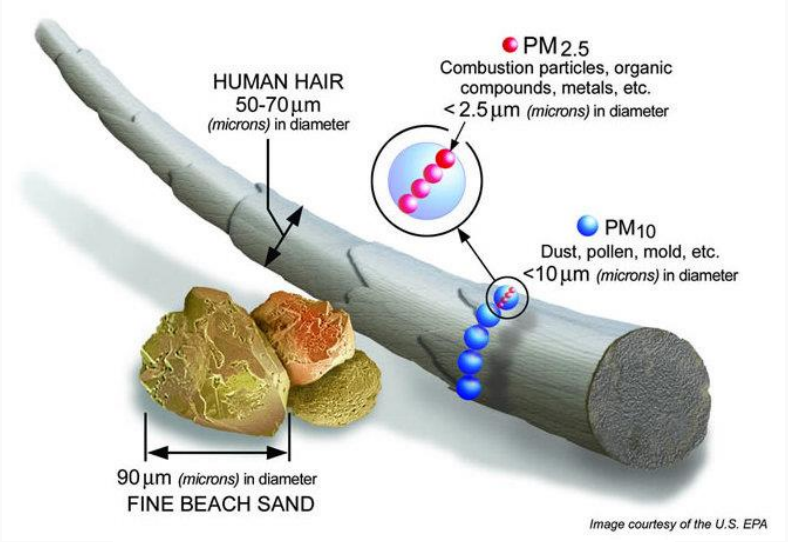
1. Populations will be affected by their vulnerability and exposure
2. Where the smoke blows can be unpredictable and can go hundreds of miles from the origin
3. Many parts of the US are vulnerable to wildfire smoke→preventatives steps and education are essential

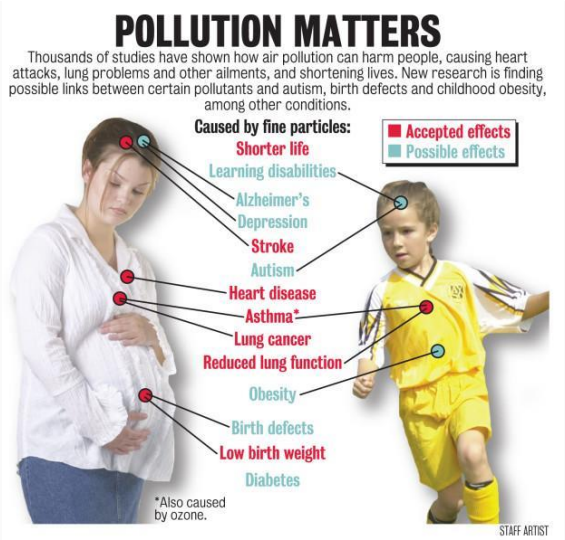


Wildfire smoke

Wildfire smoke is a combination of particulate Matter (PM2.5, PM10, and ultrafine particulate matter) and noxious gases

Wildfire smoke is ~10X as harmful to health compared to other types of air pollution (Aguilera et. al Pediatrics 2021)





Wildfires and toxicity

Wildfires are a toxic brew of

- PM2.5
- Volatile Organic Compounds
- NOx
- SOx
- Ozone
- Polyaromatic hydrocarbons
- Carbon Monoxide

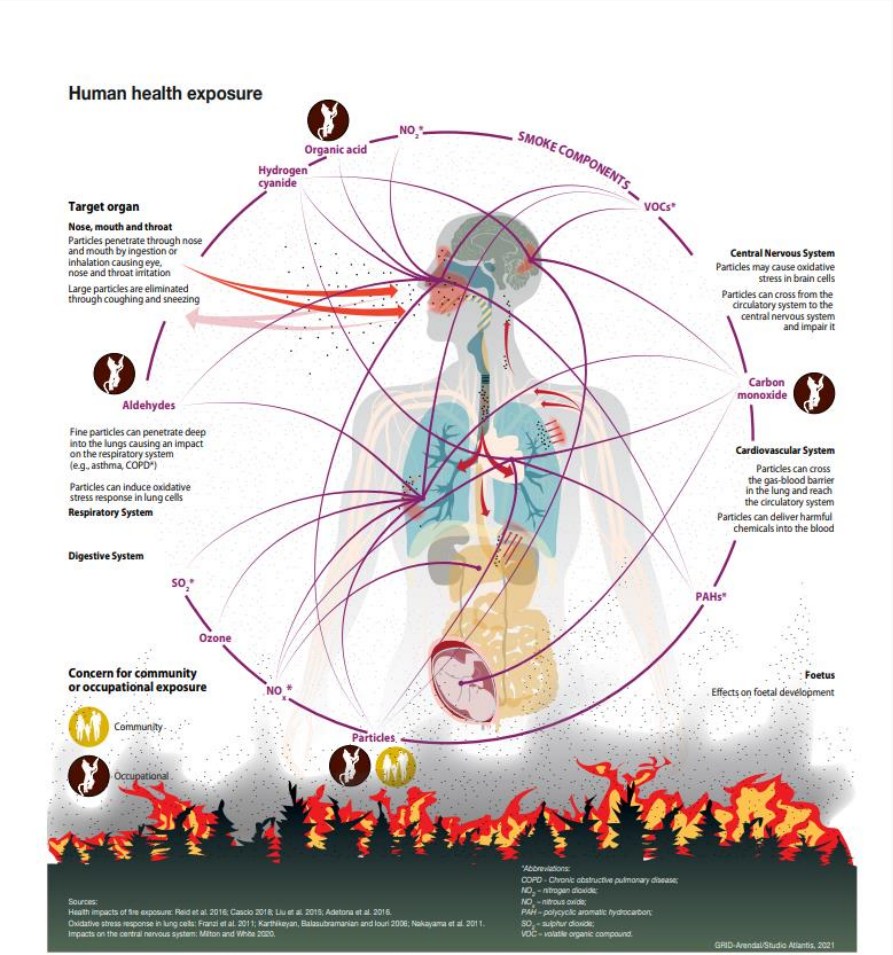
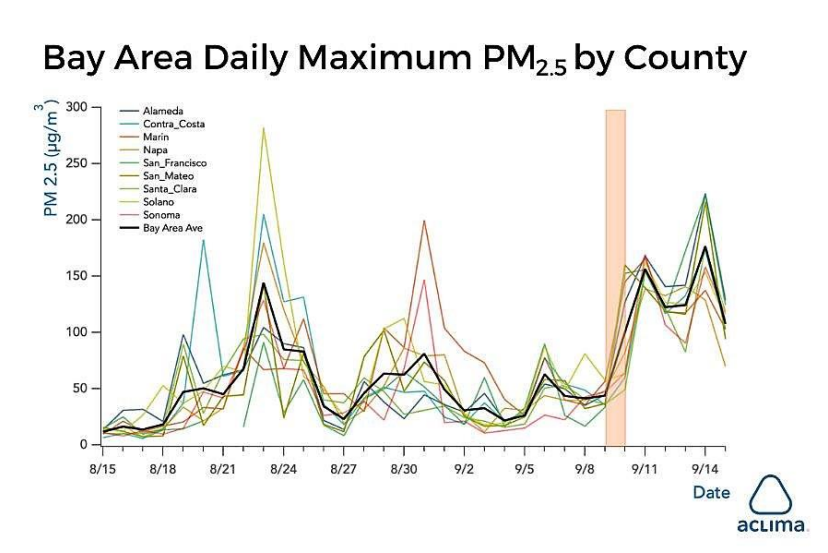


Figure 3.4. Smoke particulate exposure pathways and impacts. Smoke exposure is most commonly measured from land-based air pollutant monitors, followed by satellite-based imagery models, with fewer studies measuring personal exposure to smoke (Liu et al. 2015).

Air Quality Index



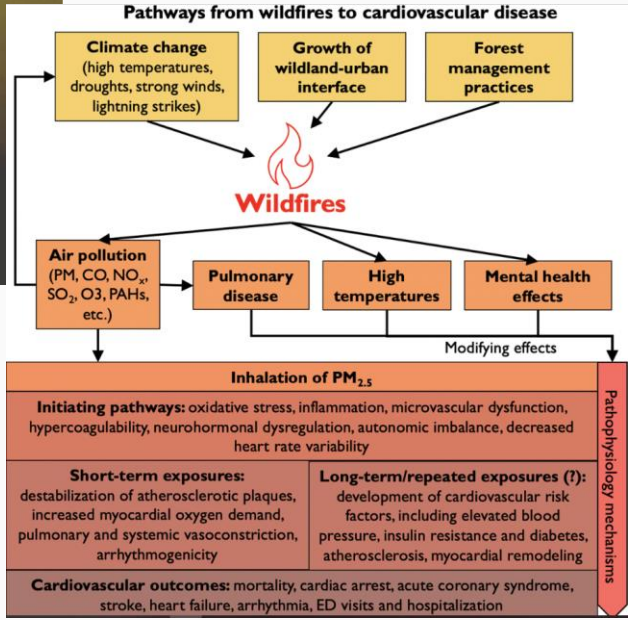
AQI Category	AQI Value	24-hr Average $PM_{2.5}$ Concentration (µg/m³)
Good	0 - 50	0 - 15.4
Moderate	51 - 100	15.5 - 40.4
USG	101 - 150	40.5 - 65.4
Unhealthy	151 - 200	65.5 - 150.4
Very Unhealthy	201 - 300	150.5 - 250.4
Hazardous	301 - 500	250.5 - 500.4

Wildfires and health

In children: increased asthma exacerbations, lower respiratory infections like pneumonia and bronchitis

In pregnancy: Evidence suggesting links between wildfire smoke and adverse birth outcomes (prematurity, low birthweight, and stillbirth)

In adults: Increased risk of a host of poor cardiovascular outcomes



Hadley, M. , Henderson, S. , Brauer, M. & Vedanthan, R. (2022). Protecting Cardiovascular Health From Wildfire Smoke. *Circulation, 146* (10), 788-801. doi: 10.1161/CIRCULATIONAHA.121.058058.

Air Pollution Disproportionately Impacts Vulnerable Populations

- Hispanic children are twice as likely to die from asthma vs. non-Hispanic Whites
- 50% of Latinos live in counties that frequently violate air quality standards
- Black children are 4 times as likely to die from asthma as White children
- Black adults are 3 times as likely to die from asthma related causes as Whites
- African American Women have the highest rate of asthma, and more have died from asthma than any other group

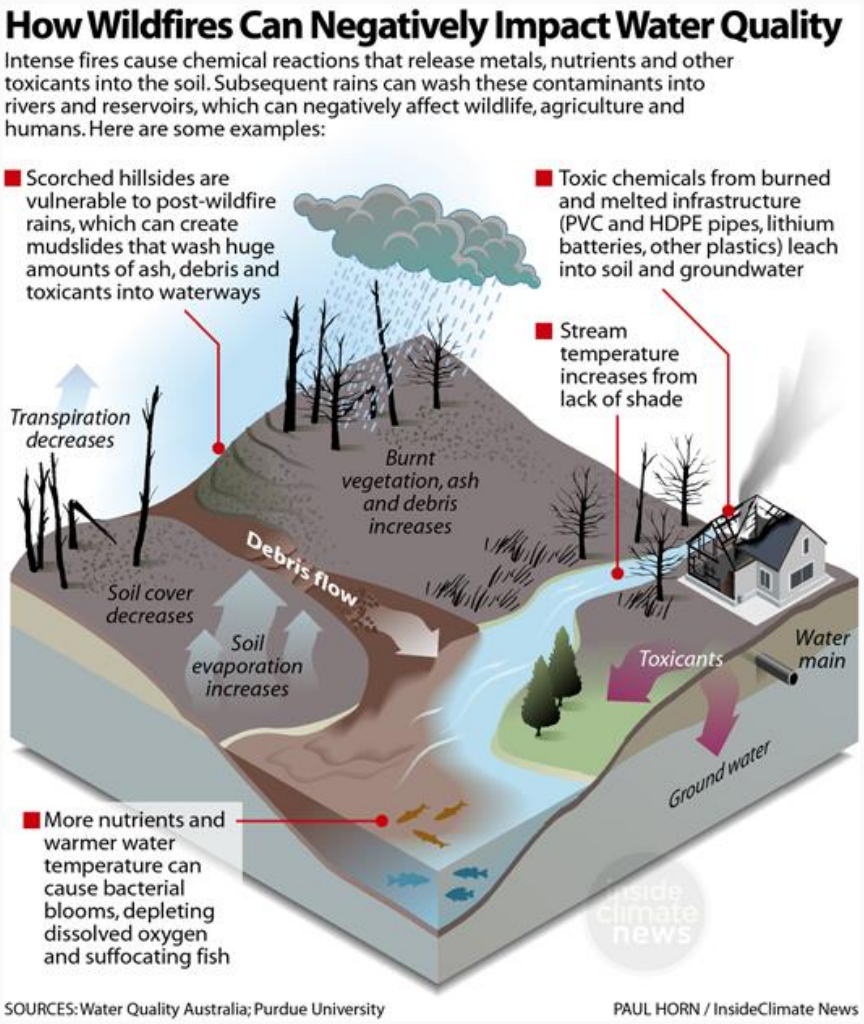
Sources: US EPA, Children's Environmental Health Disparities: Black and African American Children and Asthma | CDC, Asthma's Impact on the Nation n.d. | Fuyen, et al, CDC, 2011 |US Dept. HHS Office of Minority Health. Asthma and Hispanic Americans 2015 | Quintero, et al, 2011 | Asthma and Allergy Foundation of America, 2015 | American Lung Association| Finch, Chen, 2017

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN™

CLIMATE for HEALTH

Wildfires and water quality

- Wildfires→increased sediment that systems cannot handle
- Wildfires→Ash production→increased N and P→toxic algal blooms
- VOCs (like benzene which is carcinogenic) can get sucked into the pipes and make water unsafe



Wildfires and counseling

Choose a room for people to spend majority of their time. Bedroom +attached bath a good spot

Close windows/doors to the room.

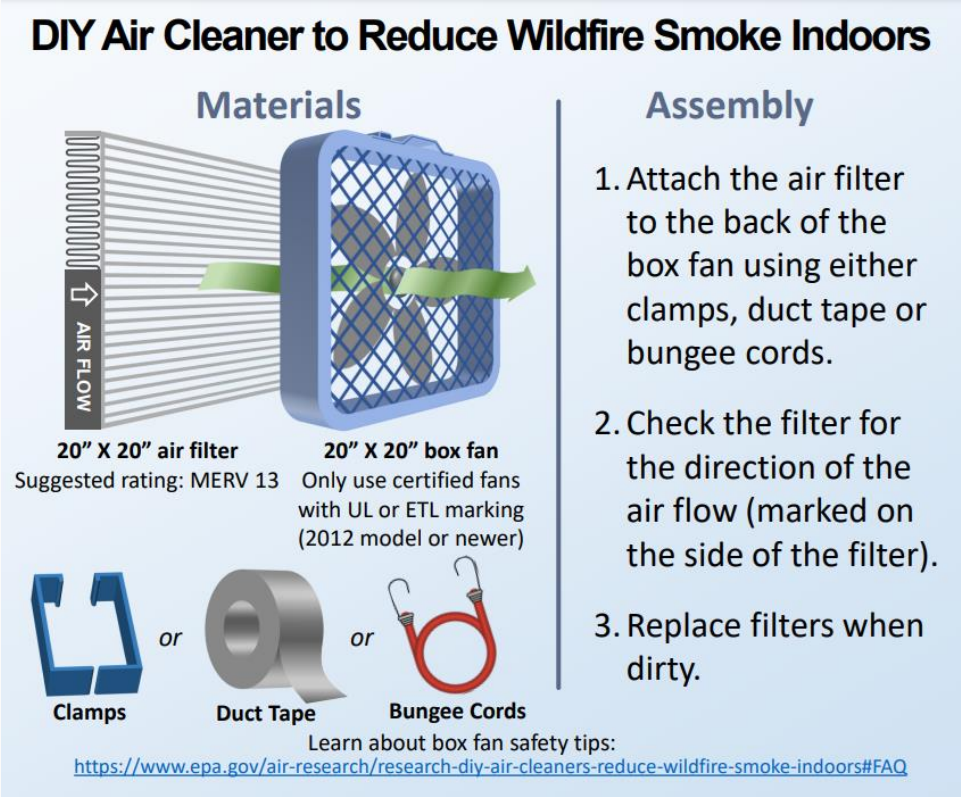
Stay cool by running fan, window AC or central AC.

Use MERV 13 filters or higher for HVAC

Use a portable air cleaner that's a right size for the room. Can also DIY for $20

Avoid activities that can worsen indoor air quality like smoking using gas stove, vacuuming, spraying aerosols, burning candles

See EPA's DIY Air Cleaner Resource



Policy solutions: Adaptation

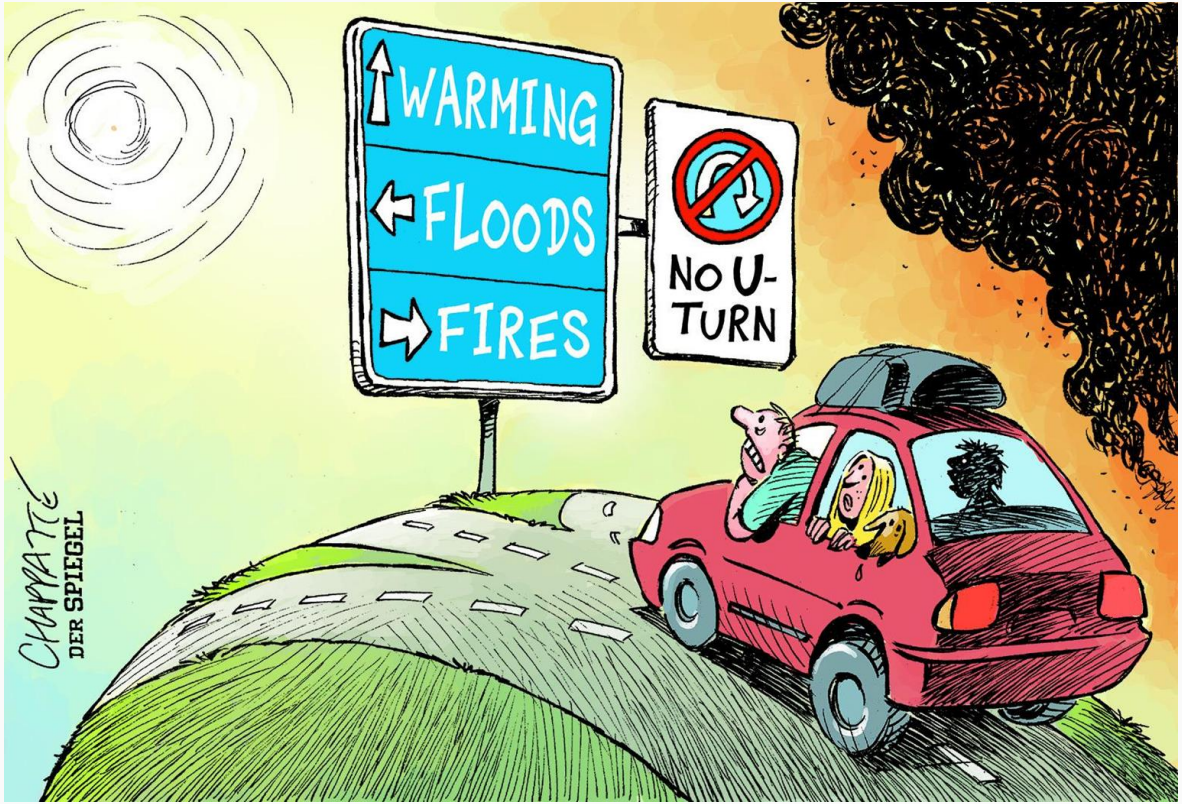
- More community engagement programs to increase preparedness/awareness

- More air filter prescription programs for vulnerable populations

Policy solutions: Mitigation

We can’t lose sight of the central importance of mitigation: We can’t merely adapt our way out of the climate crisis

#EndFossilFuels



Join your trusted health voice with mine to advocate for equitable policies that will protect human and planetary health.

Point your camera here

Become a climate/health advocate with the Medical Society Consortium on Climate and Health.

The Medical Society Consortium ON CLIMATE & HEALTH

Smart Tools for Efficient HVAC Performance (STEP) Campaign

Pacific Northwest NATIONAL LABORATORY

STEP CAMPAIGN

Scan this QR code to visit our website

Contact: christian.valoria@pnnl.gov

The STEP Campaign aims to increase adoption of smart diagnostic tools to streamline HVAC system performance testing and troubleshooting, reducing energy-wasting faults and improving occupant comfort.

To join the STEP Campaign, visit: bit.ly/3DFmEaE

HVAC Contractors and Technicians

- Reduce callbacks, improve consistency and quality, streamline processes
- Find out where to get training on smart diagnostic tools
- Be recognized for successful adoption of smart diagnostic tools!

Utilities and Program Implementers

- Streamline quality installation and quality maintenance programs
- Improve engagement with your contractors
- Be recognized for programs that utilize smart diagnostic tools!

HVAC Training Organizations

- Offer qualified training on System Performance with smart diagnostic tools
- Promote your training events
- Be recognized for providing training!

Weatherization Organizations

- Ensure your ASHP/CAC installations are operating at optimized efficiency
- Develop pilot with PNNL team
- Be recognized!

ORGANIZING PARTNERS

ACCA · BUILDING PERFORMANCE ASSOCIATION · CEE Working Together, Advancing Efficiency · HVAC Excellence · NATE · neea · U.S. DEPARTMENT OF ENERGY

Explore the Residential Program Guide

Resources to help improve your program and reach energy efficiency targets:

- Handbooks - explain *why* and *how* to implement specific stages of a program.
- Quick Answers - provide answers and resources for common questions.
- Proven Practices posts - include lessons learned, examples, and helpful tips from successful programs.
- Technology Solutions NEW! - present resources on advanced technologies, **HVAC** & **Heat Pump Water Heaters**, including installation guidance, marketing strategies, & potential savings.
- Health + Home Performance Infographic – spark homeowner conversations.

https://rpsc.energy.gov

Health + Home Performance Infographic

DOE's new Health + Home Performance Infographic reveals the link between efficiency and health – something everyone cares about. Efficiency programs and contractors can use the question-and-answer format to discover a homeowner's needs.

The infographic is ideal for the "kitchen table" conversations where people decide what to do – and who they want to do it. It also has links for homeowners to find a qualified contractor if they do not already have one.

Download this infographic from DOE's Better Buildings Residential Network.

Looking for photos to help tell your energy efficiency story? Visit our image libraries: https://www.energy.gov/eere/better-buildings-residential-network/articles/image-libraries

Thank You!

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Please send any follow-up questions or future call topic ideas to:
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